AVOIDING MALFUNCTIONS IN MEDIA GATEWAY CONTROLLERS AND/OR MEDIA GATEWAYS

This application is a § 371 National Stage application of
PCT/DE2003/02229, which was filed in the German language on July
5   3, 2003, which claims the benefit of priority to German application
No. 102 31 0262, filed July 9, 2002.

TECHNICAL FIELD OF THE INVENTION

The invention relates to a method and device for avoiding
malfunctions in media gateway controllers and/or media gateways.

10   ## BACKGROUND OF THE INVENTION

ITU-T protocols H.248 and Q.1950 specify the control of "Media
Gateways," which are commonly referred to as MGWs in cellular mobile
radio networks and fixed networks, by media gateway controllers
(MGCs). Protocol Q.1950 "Bearer independent Call Bearer Control
15   Protocol" (CBC) is used in conjunction with the BICC protocol
Q.1902.4 already specified by the ITU-T. These protocols can also be
used for 3GPP applications. Media Gateways commonly perform
functions such connecting load connection sections (for transmission
of load data such as voice, text, multimedia data) of
20   telecommunications networks, and can also convert between various
codings, such as G.711 or AMR voice codings. In this document, load
connection section termination, also refered to herein as
termination, is taken to be the termination of a section of a
network connection which is switched through the MGW for data such
25   as voice or multimedia (sound or picture) at this MGW. Through this
termination, the MGW sends and/or receives data belonging to the
load connection. In voice usage of protocols H.248 and Q.1950 a load
connection section termination corresponds to a "termination".

30   The above-mentioned protocols allow existing load connections to be
changed, by selecting another coding for example. The signaling used
between MGC and MGW (protocols H.248 and Q.1950) is designed so that
each termination in the MGW is changed independently of the other

each termination in the MGW is changed independently of the other terminations connected with it within the MGW. For example the MGW can be instructed to use another coding at this termination, or to transmit and/or receive no data, which may indicate deactivation of

5   this termination at the MGW and/or isolation of this termination at the MGW.

The MGW does not know when changing a termination whether other terminations connected by it to this termination will subsequently be changed. Therefore, when changing a termination, the MGW must

10   immediately take measures if it is connected with other terminations. In voice usage of protocols H.248 and Q.1950, terminations connected to each other within an MGW are in what is known as a shared "context" and different codings are produced that use what is known as transcoding to convert these codings into one

15   another. In special cases however the coding of all terminations connected to each other in the MGW which lie in the same "context" should be changed almost simultaneously, for example, within the framework of what is known as BICC "codec modification" or "codec renegotiation" (see Q.1902.4), via which the coding of existing

20   voice connections can be changed.

3GPP also uses said BICC procedures to switch over existing load connections between load data types such as voice and multimedia data (i.e. a combination of voice and pictures in a shared coding). The MGC can recognize such situations on the basis of what is known

25   as "Call Control" signaling e.g. Q.1902.4. Since the signaling of the MGC occurs sequentially at the MGW, an almost simultaneous switchover of all connected terminations within an MGW results in possibly undesired operating behavior. An example of such undesirable behavior may occur if the MGW briefly activates a

30   transcoder which is then almost immediately deactivated again thereby generating unnecessary operational load in an MGW and reducing the throughput. It would be acceptable, but to date has not been technically possible, to briefly interrupt the connection. In addition the MGW may establish, on changing the first termination,

35   that it cannot convert the new coding of this termination into the

coding used at the other termination(s). This can, for example, occur if the changeover is to be between a voice connection and a multimedia connection or a general data connection. The MGW in this case would reject the change of the load connection using

5 H.248/Q.1950 signaling.

SUMMARY OF THE INVENTION

The invention relates to a method for executing a command signaled from a Media Gateway Controller to a Media Gateway to change the coding of at least one load data connection section termination at

10 the Media Gateway, where the Media Gateway, after arrival of the command, checks for the connectibility of the terminations of this context with changed coding if it establishes, as a result of one or more further signaled commands arriving at the Media Gateway that it has available current commands to be executed for changing the

15 codings in terminations of this context.

The invention allows for an efficient changeover of codings in terminations present at a media gateway on an instruction to the media gateway and enables switching between codings that the media

20 gateway is unable to convert into each other.

In accordance with an aspect of the invention, a media gateway (MGW), on arrival of a command to change the coding of at least one termination of a context at the MGW, delays testing of the

25 connectibility of the terminations of this context with new coding, which is changed by a command for at least one termination, and, if necessary, also delays activation of a transcoding. These actions are delayed until the MGW establishes, on the basis of one or more signals arriving at the MGW, that it has the current outstanding

30 commands for changing codings in terminations of this context available, that is, those commands that are not already procesed. An unnecessary operating load caused by a short-term switching on and off of a transcoder can be avoided in the MGW. In an aspect of the invention, the media gateway establishes that the current

35 commands to be executed are available. For example, the MGW may

establish that the current commands which are known or forwarded to one or more MGC(s) and/or media gateways for changing coding in terminations of this context are available. The media gateway may establish this by using the signaling in the BICC procedures "Codec

5   Modification" and "Codec Renegotiation" according to Q.1902.4 and Q.1950 without messages having to be modified. The behavior of the MGW in accordance with this aspect of the invention as a reaction to incoming Q.1950 messages deviates from the behavior previously specified in Q.1950.

10

According to a further aspect of the invention, an MGW can establish on the basis of different further signaling (see reference nos. 5/7/9 in Fig. 1) that it has the commands which are available for changing terminations of this context. For example, if it has

15 received suitable signaling from the MGC such as confirm characteristic which confirm a change of the characteristic (here of the coding), or because it has received, for the terminations in a context for termination B affected by the first command a command for changing the coding of this termination.

20 According to another aspect of the invention, a Media Gateway Controller which initiates the changing of a load connection using the BICC procedures "Codec Modification" and "Codec Renegotiation" according to Q.1902.4 can simultaneously initiate these procedures in the direction of the branches of the load connection coming

25 together within it. The synchronization of these separate procedures is not currently specified in BICC. A suitable synchronization of the procedures in the MGC is also enabled by this invention.

The following embodiments of the invention are provided as examples. The invention is not limited to the embodiments provided

30 below.

1. The sequence of signaling for the BICC procedures "Codec Modification" and "Codec Renegotiation" in accordance with Q.1902.4 is utilized in order to adapt the procedures to the MGW other than in the way described in Q.1950 so that the MGW does not check for

35 transcoding needed between terminations in a context, as well as for

the activation of transcoders that may be necessary, until the point at which, in the case of a joint modification of a number of terminations, it has already received signaling from the MGC relating to the modification of the terminations.

5   2. In the case where the MGC uses the Q.1950 "Reserve Characteristics" procedure to cause the MGW to modify a termination, the MGW should perform the checking and activation of the transcoder when the MGC confirms to the MGW the modification of this termination by means of the Q. 1950 "Confirm Characteristics"

10   procedure.

3. In a further embodiment of 2, where the MGC uses the Q.1950 "Reserve Characteristics" procedure to cause the MGW to modify a termination, the MGW should also check and activate the transcoder when the MGW has received from a media gateway at the other end of a

15   load connection section with a termination in the same context a message to modify the load connection, for example the Q.2630 "Modify Bearer" procedure.

4. In a further embodiment of 2, where the MGC uses the Q.1950

20   "Reserve Characteristics" procedure to cause the MGW to modify a termination, the MGW should.also check and activate the transcoder when the MGW has also received commands from the MGC for modification via the Q.1950 "Reserve Characteristics" procedure or the Q.1950 "Modify Characteristics" procedure for all terminations

25   in the same context.

5. In the case where the MGC uses the Q.1950 "Reserve Characteristics" procedure to cause the MGW to modify a termination, the MGW should only perform the checking and activation of the

30   transcoder when the media gateway at the other end of the load connection section corresponding to the termination signals that the load connection is to be modified.

6. In a further embodiment of 5, where the MGC uses the Q.1950 "Modify Characteristics" procedure to cause the MGW to modify a

35   termination, the MGW should only check and activate the transcoder

when the MGW has also received commands from the MGC for modification via the Q.1950 "Reserve Characteristics" procedure or the Q.1950 "Modify Characteristics" procedure for the terminations in the same context.

5   7. In the case where the MGC is jointly modifying a number of terminations belonging to a load connection, where it uses the Q.1950 "Modify Characteristics" procedure for at least two terminations, the MGC should first execute the Modify Characteristics" procedure for all these terminations before it

10   sends the messages "Modify to Selected Codec information" or "Modify Codec" to the media gateways at the other ends of the corresponding load connection sections for Q.1902.4. This may occur at an MGC which initiates a simultaneous change of the load connection in two or more directions. According to BICC, Q.1902.4, the procedures

15   "Codec Modification" and "Codec Renegotiation" execute independently from this MGC in all directions.

8. In further embodiments of 1 to 7, in the MGW after the signaling · via the Q.1950 protocol by means of the "Reserve Characteristics"

20   procedure or the Modify Characteristics" procedure that the coding of a specific termination is to be changed, the terminations connected to it in the same "context" are deactivated (H.248 "stream mode"), i.e. the MGW does not direct any load data from and to these terminations. Only the first termination changed goes into the

25   transmit and receive state, i.e. forwards load data from and to the terminations involved in the same "context". Only after the arrival of commands for changing these inactive terminations in accordance with embodiments 1 to 7 will the MGW check in each case whether it can connect the termination(s) in their new coding to each other.

30

9. In further embodiments of 1 to 8, the MGW does not immediately establish the connections after the check specified in 1, but first, even if also using additional separate signaling, for example the lu FP initialization specified in 3GPP in TS 25.415 and 29.415,

35   initiates the changeover of the coding at these terminations with the media gateway at the other ends of the load connection sections

to be connected again.

10. In further embodiments of 1 to 9, the MGW does not activate the relevant termination immediately for load data, i.e. the MGW does not set it to the transmit and receive data state after receiving the command for the change from the MGC, but only does so if the changeover of the coding is undertaken by a subsequent separate signal, for example the lu FP initialization specified in 3GPP in TS 25.415 and 29.415, with the media gateway at the other end of the load connection section.

11. In further embodiments of 1 and 10, the MGW restricts the period after arrival of the first command to change a termination until the arrival of the command which initiates the check. If in this period the relevant commands for the associated load connections have not arrived, the MGW can again establish the original connection of the load connections with the old coding.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is explained in more detail below with reference to exemplary embodiments and the drawing figures in which:

Fig. 1 shows the BICC and CBC message flow when switching over a load connection from one coding to another coding where an MGC and MGW process and forward a modification of the coding of a load connection initiated by another media gateway.

Fig. 2 shows the BICC and CBC message flow when switching over a load connection from one coding to another coding where anMGC and MGW process and forward a modification of the coding of a load connection initiated by another media gateway.

Fig. 3 shows the BICC and CBC message flow when switching over a load connection from one coding to another coding where an MGC and MGW initiate the modification of a coding of a load connection in the direction of a load connection section.

Fig. 4 shows the BICC and CBC message flow when switching over a

load connection from one coding to another coding where anMGC and MGW initiate the modification of a coding of a load connection in the direction of two load connection sections connected by the MGW.

DETAILED DESCRIPTION OF THE INVENTION

5   Fig. 1 shows an aspect of the invention in which the BICC and CBC message flow when switching over a load connection from one coding to another coding where a pair having an MGC and an MGW processes and forwards a modification of the coding of a load data connection initiated by another media gateway is shown.

10   The corresponding numbers specify the timing sequence of the messages. Messages in the areas delimited by rounded edges each relate to a corresponding termination. For simplification the message flows are only shown for two terminations involved. Further terminations within the connection must be handled in a similar way.
15   The terminations are connected to each other within the MGW and lie in the same "context". Messages 2,3,4,5,7 and 9 are each confirmed by a message in the opposite direction following them.

The BICC procedure "Codec Modification" is also shown. With the BICC procedure "Codec Renegotiation", to which the present invention can
20   also be applied, the message flow is identical, but instead of the "Modify Codec" message 1 and 6 the "Modify to Selected Codec information" message is used.

The message flow is used in accordance with this aspect of the invention as follows:

25   1. The messages 2 (Q.1950 "Reserve Characteristics") and 5 (Q.1950 "Modify Characteristics") are used unchanged, as described in the protocols. The way that the MGW behaves in relation to these messages changes fundamentally.

        2. After the arrival of message 2 the MGW checks whether this
30   message is the first instruction relating to the corresponding "context" which requires a change to the coding. If this condition applies, the MGW deactivates the terminations

associated with this termination as well as the terminations in the same "context". The message explicitly defines the desired new coding for the "context".

5   3. Subsequently, but before message 3 is sent, the MGW activates the termination B, i.e. puts this into the transmit and receive load data state.

4. After arrival of message 5, or 7, or 9 the MGW checks whether
10   the new coding of a connection of the terminations A and B is possible. If this is not possible, the MGW sends a corresponding error message in the receive confirmation for 5 or 9. The further error signaling is not shown here.

15   5. If it is possible, the MGW activates termination A again using the new coding (in the case of using message 5 in Point 4, but not until the arrival of message 7) and thereby "connects" the terminations A and B.

20   6. The further inactive terminations not shown here are changed in a similar way.

Fig. 2 shows another aspect of the invention in which the BICC and CBC message flow on changeover of a load connection from one coding to another coding where a pair having an MGC and an MGW processes a
25 modification of the coding of a load connection initiated by another media gateway but does not forward it is shown.

The corresponding numbers specify the timing sequence of the messages. Messages in the areas delimited by rounded edges each relate to a corresponding termination. Messages 2,3,4 and 5 are each
30 confirmed by a message in the opposite direction following them.

The BICC procedure "Codec Modification" is also shown. With the BICC procedure "Codec Renegotiation", to which the present invention can also be applied, the message flow is identical, but instead of the "Modify Codec" message 1, the "Modify to Selected Codec information"
35 message is used.

The message flow used in accordance with this aspect of the invention is as follows:

1. The message 2 (Q.1950 "Reserve Characteristics") is used unchanged, as described in the protocols. The way that the MGW behaves in relation to these messages changes fundamentally.

2. After the arrival of message 2, the MGW checks whether this message is the first instruction relating to the corresponding "context" which requires a change to the coding. If this condition applies, the MGW deactivates the terminations associated with this termination as well as the terminations in the same "context". The message explicitly defines the desired new coding for the "context".

3. Subsequently, but before message 3 is sent, the MGW activates termination B, i.e. puts this into the transmit and receive load data state.

4. After arrival of message 5, the MGW checks whether the new coding of a connection of terminations A and B is possible. If this is not possible, the MGW sends a corresponding error message in the receive confirmation for 5. The further error signaling is not shown here.

5. If necessary based on the result of the different codings at termination A and B, the MGW inserts a transcoder and then activates termination A again using the new coding and thereby "connects" terminations A and B.

Fig. 3 shows an aspect of the invention in which the BICC and CBC message flow when switching over a load connection from one coding to another coding where a pair having an MGC and an MGW initiates modification of the coding of a load data connection in the direction of a load connection section is shown.

The corresponding numbers specify the timing sequence of the messages. Messages in the areas delimited by rounded edges each

relate to a corresponding termination. Messages 1 and 3 are each confirmed by a message in the opposite direction immediately following them.

The BICC procedure "Codec Modification" is shown. With the BICC procedure "Codec Renegotiation", to which the present invention can also be applied, the message flow is identical, but instead of the "Modify Codec" message 2 the "Modify to Selected Codec information" message is used.

The message flow is used in accordance with this aspect of the invention as follows:

1. The message 1 (Q.1950 "Modify Characteristics") is used unchanged as described in the protocols. The way that the MGW behaves in relation to these messages changes fundamentally.

2. After the arrival of message 1, the MGW checks whether this message is the first instruction relating to the corresponding "context" which requires a change to the coding. If this condition applies, the MGW deactivates the terminations associated with this termination as well as the terminations in the same "context". The message explicitly defines the desired new coding for the "context".

3. Subsequently, the MGW activates termination A, i.e. puts this into the transmit and receive load data state.

4. After arrival of message 3, the MGW checks whether the new coding of a connection of terminations A and B is possible.

5. If this is necessary as a result of the different codings at termination A and B, the inserts a transcoder and then activates termination B again using the new coding and thereby "connects" terminations A and B.

Fig. 4 shows an aspect of the invention in which the BICC and CBC message flow when switching over a load connection from one coding

to another coding where a pair having an MGC and an MGW initiates
modification of the coding of a load data connection in the
direction of two load connection sections connected by the MGW is
shown.

5   The corresponding numbers specify the timing sequence of the
messages. Messages 3, 4, 5 and messages 3a, 4a, 5a are executed
independently of any other message flow. Messages in the areas
delimited by rounded edges each relate to a corresponding
termination. For simplification the message flows are only shown for
10 two terminations involved. Further terminations within the
connection are handled in a similar way. The terminations are
connected to each other within the MGW and lie in the same
"context". Messages 1, 2, 4 and 4a are each confirmed by a message
in the opposite direction following them.

15 The BICC procedure "Codec Modification" is shown. With the BICC
procedure "Codec Renegotiation", to which the present invention can
also be applied, the message flow is identical, but instead of the
"Modify Codec" message 3 and 3a the "Modify to Selected Codec
information" message is used.

20 The message flow is used in accordance with this aspect of the
invention as follows:
1. Messages 1 and 2 (Q.1950 "Modify Characteristics") are sent by
    the MGC and confirmed by the MGW before the MGC sends the
    messages 3 and 3a (Q.1902.4 "Modify Codec). According to
25   Q.1902.4 the only requirement is for the MGC to send message 1
    before message 3 and message 2 before message 3a.

2. Messages 1 and 2 (Q.1950 "Modify Characteristics") are used
    unchanged, as described in the protocols. The way that the MGW
30   behaves in relation to these messages changes fundamentally.

3. After the arrival of message 1, the MGW checks whether this
    message is the first instruction relating to the corresponding
    "context" which requires a change to the coding. If this
35   condition applies, the MGW deactivates the terminations

associated with this termination as well as the terminations in the same "context". The message explicitly defines the desired new coding for the "context".

4. Subsequently the MGW activates termination A, i.e. puts this into the transmit and receive load data state.

5. After arrival of message 2, or 4, or 4a, the MGW checks whether in the new coding a connection of the terminations A and B is possible.

6. The MGW activates termination B again using the new coding where message 2 is used in Point 5 following the arrival of message 4a and thereby "connects" terminations A and B.

7. Further inactive terminations not shown here are changed in a similar way.